UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,298	02/06/2004	William Allen Rogers JR.	VEL03-GN003	5458

30074 7590 12/08/2008

TAFT, STETTINIUS & HOLLISTER LLP
SUITE 1800
425 WALNUT STREET
CINCINNATI, OH 45202-3957

EXAMINER	
MERKLING, MATTHEW J	
ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
12/08/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/774,298	ROGERS ET AL.	
	Examiner	Art Unit	
	MATTHEW J. MERKLING	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *See Continuation Sheet* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,7-9,11-15,17,18,20,22,26,29,31-33,48,53,54,57,58,61,62,66,68-74 and 97-110* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims pending in the application are 1,7-9,11-15,17,18,20,22,26,29,31-33,48,53,54,57,58,61,62,66,68-74 and 97-110.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 7-9, 11, 12, 17, 18, 20, 22, 26, 29, 31, 33, 57, 61, 62, 64, 66, 68-70, 74, 97-105 and 107-109 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonjo et al. (US 6,159,434) in view of Reiser (GB 2128013).

Regarding claims 1, 7-9, 11, 12, 17, 18, 20, 22, 26, 29, 31, 33, 57, 64, 66 and 74, Gonjo discloses a chemical process system comprising:

a steam conduit (methanol and water conduit, see Fig. 1A);

a hydrocarbon conduit (methanol and water conduit, see Fig. 1A);

a fuel conduit (off gases conduit, see Fig. 1A);

an oxygen source conduit (air conduit, see Fig. 1A);

a product conduit (reformed gases conduit, see Fig. 1A);

an exhaust conduit (combustion gases conduit, see Fig. 1A);

a first microchannel module including:

a first set of microchannels (upper reforming portion of plate style reactor, see Fig. 1A) in communication with the steam conduit via a steam manifold, the hydrocarbon conduit via a hydrocarbon manifold, and the product conduit via a product manifold (see

Fig. 1A where each conduit is joined with the associated microchannels), the first set of microchannels including a first steam reformation catalyst (in reforming portion 4); and

a second set of microchannels (upper combustion portion of plate style reactor, see Fig. 1A) in communication with the fuel conduit via a fluid manifold, the oxygen source conduit via an oxygen source manifold, and the exhaust conduit via an exhaust manifold (see Fig. 1A where each conduit is joined with the associated microchannels), the second set of microchannels being in thermal communication with the first set of microchannels (combustion heat is thermally transferred to the reforming reaction, see abstract); and

a second microchannel module fluidically arranged in parallel with the first microchannel module (see Fig. 9 which indicates two microchannel modules, upper and lower, which operate in parallel) and including

a third set of microchannels (lower reforming portion of plate style reactor, see Fig. 1A) in communication with the steam conduit via the steam manifold, the hydrocarbon conduit via the hydrocarbon manifold, and the product conduit via the product manifold (see Fig. 1A where each conduit is joined with the associated microchannels), the third set of microchannels including a second steam reformation catalyst (in reforming portion 4); and

a fourth set of microchannels (lower combustion portion of plate style reactor, see Fig. 1A) in communication with the fuel conduit via the fuel manifold, the oxygen source conduit via the oxygen source manifold, and the exhaust conduit via the exhaust manifold (see Fig. 1A where each conduit is joined with the associated microchannels), the fourth

set of microchannels being in thermal communication with the third set of microchannels (combustion heat is thermally transferred to the reforming reaction, see abstract).

While Gonjo teaches a plate style chemical process system that is designed to be compressed together in order to prevent leaking reactants and products (see col. 14 lines 27-35), Gonjo fails to disclose the chemical process system contained in a pressure vessel and also fails to disclose the associated pressure control devices incorporated by said pressure vessel.

Reiser also discloses a chemical process system that comprises a plate style apparatus (fuel cell stack, 10, see Fig. l, page 1 lines 105-110) that addresses the same problem of leaking from a plate style chemical process system (see page 1 lines 53-59).

Reiser teaches: a pressure vessel (14) at least partially containing a operation therein (10, see Fig. 1), the pressure vessel concurrently adapted to be occupied by a medium (such as inert gas, supplied) to compress the chemical reactor in order to prevent any leaking of reactants or products from the chemical reactor by maintaining a pressure inside the pressure vessel higher than the pressure in the chemical reactor (page 1 lines 45-52);

a stream adapted to be in fluid communication with an inert medium source (same as inert gas mentioned above) for conveying the inert medium from the inert medium source and into fluid communication with the first chemical reactor (page 1 lines 45-52); and

a recycle stream for cycling the compressive medium into and out of the pressure vessel (see flow diagram of Fig. 1).

Reiser teaches this pressure vessel as an effective means for preventing the leaking of valuable reactants and products from a chemical reactor that is comprised of a plate style apparatus (page 1 lines 45-59).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the pressure vessel and associated structure of Reiser, to the chemical process system of Gonjo in order to further prevent valuable reactants and products from leaking out of a chemical reactor.

Regarding limitations recited in claims 1, 7-9, 17, 22, 31 and 68-70 which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969) thatstates "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

Regarding claims 61 and 62, Gonjo further discloses the heat exchanger (such as catalytic combustion portion, 6a or 6b) includes a chemical reactor (catalytic combustor) in thermal communication with the first chemical reactor (reformer).

Regarding claim 97, Gonjo further discloses the steam conduit and the hydrocarbon conduit are a combined conduit (see Fig. 1A, methanol + water).

Regarding claim 98, Gonjo further discloses the steam conduit and the hydrocarbon conduit are separate conduits (col. 26 lines 21-25).

Regarding claim 99, Gonjo further discloses the oxygen source conduit is adapted to supply air to the second set of isolated microchannels (air is supplied to the combustion portion of the microchannels, see Fig. 1A).

Regarding claim 100, Gonjo further discloses the steam conduit and the hydrocarbon conduit are a combined conduit and the steam manifold and the hydrocarbon manifold are a combined manifold (see Fig. 1A, methanol + water, see inlet and outlet manifolds/endplates in Fig. 9).

Regarding claim 101, Gonjo further discloses the steam conduit and the hydrocarbon conduit are separate conduits; and wherein the steam manifold and the hydrocarbon manifold are separate manifolds (col. 26 lines 21-25 see inlet and outlet manifolds/endplates in Fig. 9).

Regarding claim 102, Gonjo further discloses the oxygen source conduit and oxygen source manifold are adapted to supply air to the second set of microchannels and the fourth set of microchannels (air is supplied to the combustion portion of the microchannels, see Fig. 1A and 9).

Regarding claim 103 and 107, Gonjo further discloses the first set of isolated microchannels and the second set of isolated microchannels include an arrangement of repeating units (see Fig. 9 which discloses two identical units operating in parallel).

Regarding claim 104 and 108, Gonjo further discloses one of the repeating units includes

a reactant microchannel (channel in which reaction takes place in the reforming portion 4) and a product microchannel (channel in which the reformed gas leaves the

chemical process system, see Fig. 1A and Fig. 12) of the first set of isolated microchannels, and

a fuel microchannel (channel in which fuel/off gas enters the second set of isolated microchannels), an oxygen source microchannel (channel in which the air enters the second set of microchannels), and a product microchannel (channel in which the combustion exhaust leaves the chemical process system) of the second set of isolated microchannels; and

wherein the reactant microchannel of the first set of isolated microchannels is adjacent the fuel microchannel of the second sot of isolated microchannels (see Fig. 1A which discloses the reactant microchannel (reforming portion 4) and the fuel microchannel (combustion portion) adjacent to each other).

Regarding claim 105 and 109, Gonjo further discloses the oxygen source microchannel interposes the fuel microchannel and the product microchannel of the second set of isolated microchannels (see Fig. 1A which discloses the air inlet is between the fuel inlet and the product/exhaust outlet).

3. Claims 106 and 110 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonjo et al. (US 6,159,434) in view of Reiser (GB 2128013) as applied to claim 105 and 109 above, and further in view of Romatier (US 6,190,624).

Regarding claims 106 and 110, Gonjo does not explicitly disclose the repeating unit includes

two reactant microchannels of the first set of isolated microchannels interposed by the product microchannel of the first set of isolated microchannels,

two oxygen source microchannels of the second set of isolated microchannels interposed by the product microchannel of the second set of isolated microchannels, and

two fuel microchannels of the second set of isolated microchannels interposed by the two oxygen source microchannels of the second set of isolated microchannels and the product microchannel of the second set of isolated microchannels.

However, Gonjo does teach, throughout the reference, of heat integration between all the streams (see abstract and drawings, for example) in a plate style reactor.

Romatier also teaches heat integration between channels in a plate (see abstract).

Romatier teaches a reaction flow channel and heat transfer channel which are arranged about each other in an alternating fashion (see Fig. 6) as a preferable means of heating/preheating fluids in a plate style reactor and making the resulting structure more compact (see abstract).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize an alternating channel arrangement (as taught by Romatier) in the plate style reactor of modified Gonjo in order to provide a compact design for the plate reactor as well as preheating the incoming streams with the exiting heated product streams.

4. Claims 13-15, 32, 48, 53, 54, 58 and 71-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gonjo et al. (US 6,159,434) and Reiser (GB 2128013) as applied to claims 1, 17 and 25 above, and further in view of Toole et al. (US 4,167,915).

Regarding claims 13-15, 32, 48, 53, 54, 58 and 71-73 Gonjo, as modified by Reiser and discussed in claims 1, 17 and 25, teaches:

a first chemical reactor (reformer, 4, see Fig. 1A) comprising microchannels (compact plate style reformer with channels, see col. 28 lines 32-38 and see channels in Figs 6 and 7, for example) adapted to be in fluid communication with an inlet stream (liquid feed, see Fig. 1 A) and an outlet stream (Reformed Gas, see Fig. 1A) for carrying out a continuous process;

a second chemical reactor (catalytic combustor, 6a and 6b, see Fig. 1 A) in thermal communication with the first chemical reactor (see Fig. 1A, Where catalytic combustion portions 6a and 6b are in thermal communication with reforming portion 4);

wherein the first and second chemical reactors are coupled to each other (see flow diagram of Fig. 1A where reforming portion and catalytic combustion portion are fluidly connected);

wherein the first and second chemical reactors also include a heat exchanger upstream and downstream from said chemical reactors (see flow diagram in Fig. 1A where inlet and outlet streams of the first and second chemical reactors are in contact with a heat exchanger);

a pressure vessel (14) at least partially containing a operation therein (10, see Fig. 1), the pressure vessel concurrently adapted to be occupied by a medium (such as inert gas,

supplied) to compress the chemical reactor in order to prevent any leaking of reactants or products from the chemical reactor by maintaining a pressure inside the pressure vessel higher than the pressure in the chemical reactor (page 1 lines 45-52);

a stream adapted to be in fluid communication with an inert medium source (same as inert gas mentioned above) for conveying the inert medium from the inert medium source and into fluid communication with the first chemical reactor (page I lines 45-52); and

a recycle stream for cycling the compressive medium into and out of the pressure vessel (see flow diagram of Fig. I).

In other words, modified Gonjo teaches a pressure vessel that maintains and controls a pressure differential between the pressure vessel and the chemical reactors, as discussed above, but fails to disclose the specific control mechanism that is used to maintain the pressures in the pressure vessel and the chemical reactor.

Toole also discloses a system that maintains and regulates pressures between a pressure vessel (shell, 5) that comprises an inert gas and a chemical reactor (wafer oxidation, 11).

Toole teaches a controller operatively coupled to a first sensor monitoring an internal pressure within the pressure vessel and a second sensor monitoring an internal pressure within the first chemical reactor (see outlet lines 22 and 23 from the pressure vessel and chemical reactor, respectively, which connect to back pressure regulators 61 and 64, which sense the pressure differential in the two spaces and adjust the outlet flows to reach the desired differential, see col. 4 lines 26-45). Furthermore, Toole discloses a vent (66) in fluid communication with the pressure vessel to selectively vent the inert medium (col.

4 lines 26-45). Toole teaches this configuration as a preferable means for simultaneously maintaining pressure control inside a pressure vessel as well as a chemical reactor inside said pressure vessel (col. 3 lines 3-17).

As such, it would have been obvious to one of ordinary skill to add the pressure control means of Toole, to modified Gonjo, in order to preferably control the pressure inside the pressure vessel at a higher pressure than that of the chemical reactors (as mentioned above}.

Regarding limitations recited in claim 58 which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

Response to Arguments

5. The objection to claim 66 is withdrawn in light of the amendments.

6. Applicant's arguments filed 10/16/08 have been fully considered but they are not persuasive.

7. On page 15, Applicant argues that “the final Office action's alleged motivation to combine the references relies on solving an apparently nonexistent problem”. The examiner

respectfully disagrees with this argument. It is the examiner's position that providing a manufactured chemical reactor, which contains toxic/combustible fluids, inside a pressure vessel to prohibit leaking of the chemical reactor to the outside environment, is obvious to one of ordinary skill in the art, as set forth above. The precise reasons for using a pressure vessel disclosed by Reiser may be different than the reasons for combining such a vessel with Gonjo, but it is the examiner's position that the teachings of both Gonjo and Reiser would lead a person of ordinary skill in the art to make such a combination.

Furthermore, it is also noted that although Applicant argues (on page 16) that combining Gonjo and Reiser would require a change in the intended purpose/operation of the references, such arguments are based on applying the plate structure of Reiser to the structure of Gonjo, which was never suggested by the examiner in the rejections.

The examiner understands Applicants argument, but respectfully disagrees. Reiser does not teach away from Gonjo with respect to the cited leakage of the stack in Gonjo. Both Reiser and Gonjo have devices in a plate style configuration which are designed to prevent the leakage of reactants/products out of the stack. In other words, while the structure of the stacks in Gonjo and Reiser are not identical, they are both designed to prevent outward leaks of products/reactants. It is also noted that the precise structure of the stack of Reiser is irrelevant, as Gonjo was not modified by the fuel cell stack of Reiser, but rather with the pressure vessel of Reiser which prevents leakage of products and chemicals out of the stack configuration. The concept of the pressure vessel inhibiting leakage is well known in the art and the combination with Gonjo amounts to nothing more than the use of a known technique to improve similar devices in the same way.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. MERKLING whose telephone number is (571)272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. M./
Examiner, Art Unit 1795

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795